

Common VV&A Product Formats

RPG Templates

4 August 2004

Table of Contents

<u>Introduction</u>	1
<u>Essential VV&A Documentation</u>	2
Accreditation Products	3
V&V Products	5
Supporting Documentation	6
<u>VV&A Product Templates</u>	8
Accreditation Templates	9
V&V Templates	15
Supporting Product Templates	25
<u>References</u>	28
RPG References in This Document	29

Introduction

A verification and validation (V&V) effort is documented to capture valuable evidence for use in the accreditation assessment. An accreditation assessment is documented to provide the decision maker with conclusions and recommendations regarding the fitness of the simulation for the intended purpose. VV&A documentation also provides essential information of simulation capabilities and limitations for current and future users of the simulation. The templates presented in this document are based on the guidance presented in other sections of the VV&A RPG and show, in general, possible categories of information that may be collected to support the VV&A of a new or legacy simulation.¹ They are intended to serve as guides only. For a given VV&A effort, the types of documents produced and the information to be included in each should be determined during the planning process. They should be based on the needs of the intended application and structured to support the M&S configuration management process.

Examples:






- When a well-documented legacy simulation requires only minor modifications, there may be no need to conduct V&V activities on all aspects of the simulation and its artifacts. The V&V Agent may choose to produce one detailed V&V report instead of separate reports for each V&V activity and one summary V&V report.
- The VV&A effort for a spiral development M&S program will generate V&V reports at the end of each milestone or spiral. Accreditation reports are generally produced only for interim and final product releases.
- For the VV&A effort of a federation or distributed simulation suite, the owners of the individual federates and components are responsible for providing V&V evidence of their individual capabilities. However, the overall federation VV&A effort may require additional information about individual federate capabilities as well as their ability to interoperate with each other. This information should be compiled and documented in an integrated VV&A report.

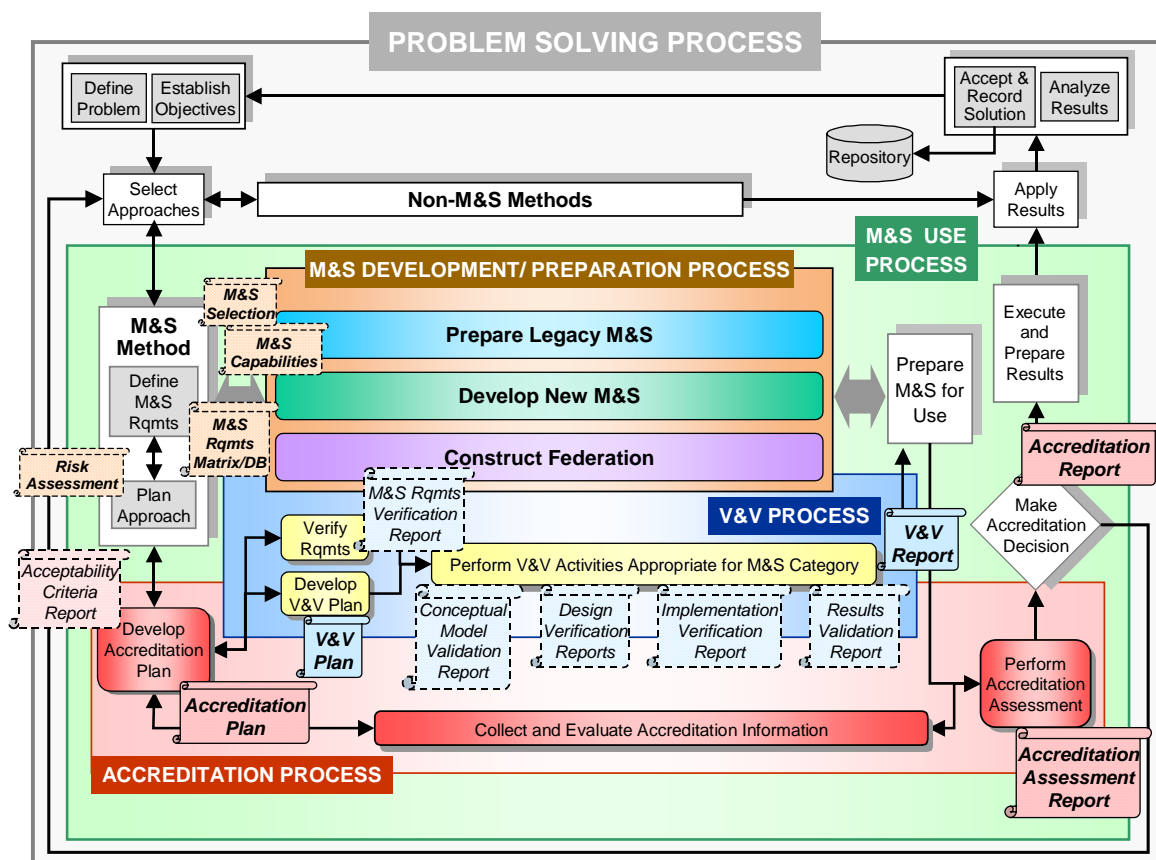
Formats should be adapted to provide the information needed to satisfy the intended use and should be structured to conform to the reporting requirements of the simulation's configuration management system. Automated aids for generating reports should be used when available to support standardization and to reduce the cost and time of report preparation.

¹ These templates focus on the VV&A products associated with new simulation development and legacy simulation use. They do not address the particular VV&A products and support artifacts associated with federations and distributed simulation. These will be provided in a separate document.

Essential VV&A Documentation

A number of different types of documents supporting the VV&A process can be produced throughout the life cycle of the simulation. These are depicted as color-coded scroll-shaped boxes in the diagram below, located at the points in the process where the information to be recorded is normally available.

- basic V&V products are shown as blue scrolls with solid outlines 
- recommended supporting V&V products are depicted as blue checkered scrolls with dashed lines 
- basic accreditation products are shown as pink dotted scrolls with solid outlines 
- recommended auxiliary accreditation products are depicted as pink, wavy-lined scrolls with dashed outlines 
- recommended simulation and application supporting documents are depicted in orange speckled scrolls with dashed outlines 



VV&A Reports in the Overall Problem Solving Process

These products are listed below and synopsized in the following paragraphs. Templates are included at the end of this document.

[Accreditation Products](#) [p. 3]:

- Accreditation Plan
- Accreditation Assessment Report
- Accreditation Report
- Accreditation Auxiliary Products:
 - Acceptability Criteria Report

[V&V Products](#) [p. 5]:

- V&V Plan
- V&V Report
- V&V Auxiliary Products:
 - M&S Requirements Verification Report
 - Simulation Conceptual Model Validation Report
 - Design Verification Report(s)
 - Implementation Verification Report
 - Results Validation Report
 - Data V&V Reports

[Supporting Documentation](#) [p. 7]:

- M&S Requirements Matrix
- Simulation Capability Report
- Risk Assessment Report
- Simulation Selection Report

Accreditation Products

Accreditation Plan

The [accreditation plan](#) [p. 9] is prepared by the Accreditation Agent.² It identifies the information needed (i.e., accreditation information needs) to assess the fitness of the simulation for the intended application, establishes their priorities based on associated risk, details the approach to be used for collecting or generating the information, and details the approach for conducting the assessment. It also identifies the personnel and resources needed to perform the accreditation assessment, establishes the schedule,

² See the core documents on the Accreditation Agent role for additional information.

and defines the relationship of the accreditation effort to simulation preparation and the V&V effort.

Accreditation Assessment Report

The [accreditation assessment report](#) [p. 11] is prepared by the Accreditation Agent.³ It is used in formulating the accreditation decision. It includes a list of the M&S requirements and acceptability criteria used in the assessment, a list of the accreditation information needs and priorities, a discussion of the assessment process comparing the simulation capabilities and the M&S requirements of the intended application, a summary of the simulation's development and use history, estimates of costs and resource needs of using the simulation, results of the assessment identifying simulation limitations, recommendations on the accreditation decision.

Accreditation Report

The [accreditation report](#) [p. 13] is prepared by the Accreditation Agent or the User.⁴ It documents the User's accreditation decision (i.e., full accreditation, conditional accreditation, simulation modification is needed, additional information is needed, no accreditation), the rationale behind that decision, and all the constraints placed upon the simulation's use in the intended application. If the accreditation decision is to conduct additional work to modify the simulation or to obtain additional information (e.g., conduct additional testing or V&V), this report should detail what steps are to be taken. This report should also include the Accreditation Assessment report and the V&V report as attachments.

Acceptability Criteria Report

The [acceptability criteria report](#) [p. 14] is an auxiliary report prepared by the Accreditation Agent and/or the User. It includes a description of the acceptability criteria selected to define, or measure, how well the simulation needs to represent each M&S requirement and the rationale used in their selection.⁵ The acceptability criteria are used during the accreditation assessment to determine if the simulation is fit for the intended use and during the V&V planning to determine what tasks to perform, what techniques to use, and what data to collect in order to provide the information needed in the accreditation assessment. This report provides information needed to support all phases of accreditation and V&V planning and implementation. Although the information provided by this report is essential, it may be provided in another form (e.g., M&S Requirements Matrix). When more than one source is available, the information from each should be reviewed to ensure consistency.

³ See the core documents on the Accreditation Agent role for additional information.

⁴ See the core documents on The Accreditation Agent Role for additional information.

⁵ See the special topics on Requirements and Measures for additional information.

V&V Products

V&V Plan

The [V&V plan](#) [p. 15] is usually prepared by the V&V Agent although it may be initiated by the Accreditation Agent or the M&S Program Manager (M&S PM) when the selection of the V&V Agent is delayed.⁶ It identifies the V&V tasks to be performed to address the accreditation information needs and priorities, the requirements to be addressed and the acceptability criteria to be used in validation, the data and techniques to be used, the data to be collected, and the rationale for each. For medium and large V&V efforts, the V&V tasks are organized into activities, each of which focuses on a specific artifact of the simulation (i.e., M&S requirements, simulation conceptual model, design, implementation [code], results [output])⁷. The plan also identifies the personnel and resources needed to perform each task, establishes the schedule, and defines the relationship between individual V&V tasks and activities and the activities detailed in the simulation development or modification plan.

V&V Report

The [V&V report](#) [p. 18] is prepared by the V&V Agent.⁸ This report details the conduct of each task, including the assumptions and constraints involved, the M&S requirements addressed and the acceptability criteria used in the validation, the techniques and data employed, the results of each task, and the insights and recommendations resulting from analysis of the results. The report also includes the analysis of the overall V&V effort, including conclusions and recommendations. Actual documentation of each task and data used in the analyses are referenced or included in attachments.

Auxiliary V&V Reports

For extensive V&V efforts, individual V&V activities are often documented in separate auxiliary or interim reports. The overall V&V Report then summarizes the results of each activity and provides analysis, conclusions, and recommendations of the overall effort. The individual V&V activity reports are referenced or included as attachments. These individual V&V activity reports include:

- [M&S Requirements Verification Report](#) (p 19) — This report should be prepared by whoever is responsible for conducting the requirements verification. When the V&V Agent is not available to do so, it is generally conducted by SMEs designated by the User.⁹ The V&V Agent is, however, responsible for reviewing the report and ensuring the effort was sufficient and complete. Actual

⁶ See the core documents on the V&V Agent role for additional information.

⁷ Activities can be organized in other ways, depending on the needs of the specific V&V project; however, organizing around the simulation development/modification artifacts and products being evaluated is a common approach.

⁸ See the core documents on the V&V Agent role for additional information.

⁹ See the core documents on the V&V Agent role for additional information.

documentation of each task and data used should be referenced or included in attachments.¹⁰

- [Simulation Conceptual Model Validation Report](#) [p. 20] — This report should be prepared by the V&V Agent and details the tasks performed in evaluating the completeness, accuracy, and consistency of the simulation conceptual model. Data V&V tasks performed in conjunction with this activity should be referenced here and detailed in appropriate Data V&V Reports. Actual documentation of each task and data used should be referenced or included in attachments.¹¹
- [Design Verification Reports](#) [p. 21] — These reports are prepared by the V&V Agent and detail the tasks performed in evaluating the completeness, accuracy, and consistency of the different iterations of the design (e.g., high level design and the detailed design). Tasks performed by the Developer or others to support this activity should be detailed here. Data V&V tasks performed in conjunction with this activity should be referenced here and detailed in appropriate Data V&V Reports. Actual documentation of each task and data used should be referenced or included in attachments.
- [Implementation Verification Report](#) [p. 22] — This report is prepared by the V&V Agent. It details the tasks performed in evaluating the completeness, accuracy, consistency of the code and the implementation. Tasks performed by the Developer and others to support this activity should be detailed here. Data V&V tasks performed in conjunction with this activity should be referenced here and detailed in appropriate Data V&V Reports. Actual documentation of each task and data used should be referenced or included in attachments.
- [Results Validation Report](#) [p.23] — This report is prepared by the V&V Agent and details the tasks performed in determining the extent to which the simulation's results provide the fidelity needed for the intended application.¹² The actual tests performed, data sets used, and validation data used for the referent should be included as attachments whenever possible.¹³ Tasks performed by the Developer, testers, or others to support this activity should be detailed here. Data V&V tasks performed in conjunction with this activity should be referenced here and detailed in appropriate Data V&V Reports.
- [Data V&V Reports](#)¹⁴ [p. 24] — These reports are prepared by the V&V Agent for each data set. Ideally, data V&V tasks are performed in conjunction with specific simulation V&V activities and as early as possible in the overall V&V effort. However, because of the myriad of data involved and because different data sets come from different authoritative sources at different times, individual data V&V tasks are conducted throughout the V&V effort. Individual data V&V tasks should be recorded as part of the simulation V&V activity with which they are associated. However, the information from all data V&V tasks performed on

¹⁰ See the special topic on Requirements for additional information.

¹¹ See the special topic on Conceptual Model Development and Validation for additional information.

¹² See the special topic on Fidelity for additional information.

¹³ See the special topic on Validation for additional information.

¹⁴ See the special topics on Data V&V for additional information.

a specific data set should be collected and documented in a Data V&V Report to be shared with the data provider.

Supporting Documentation

M&S Requirements Matrix/Database

A [requirements matrix](#) or database [p. 25] is generally prepared by the Developer but it may also be prepared by the V&V Agent or the Accreditation Agent. It is used to trace the M&S requirements through the different phases of the simulation development and preparation to ensure they are being consistently and adequately addressed.¹⁵ The matrix should also include information regarding how each M&S requirement should be measured or evaluated and what acceptability criteria should be used.¹⁶ This matrix provides information needed to support all phases of accreditation and V&V planning and implementation. Although the information available in this matrix is essential, it may be provided in another form (e.g., Acceptability Criteria Report). When more than one source is available, the information from each should be reviewed to ensure consistency.

Simulation Capability Report

The [simulation capability report](#) [p. 26] is associated with legacy simulation reuse. It is prepared by the V&V Agent or a Developer to give a decision maker's a general idea of the simulation's capability. It may be prepared for the Accreditation Agent to use in determining the scope of the accreditation assessment.¹⁷ The User can also find it useful for comparing candidates during legacy simulation selection.

Simulation Selection Report

A [simulation selection report](#) [p. 26] is useful in legacy simulation reuse when multiple candidates are under consideration. It is generally prepared by the User or Accreditation Agent.¹⁸ The simulation selection process provides a vehicle by which the risks associated with using each candidate in the intended use can be assessed. The resulting report, which documents the selection decision and rationale, provides information used in the accreditation assessment.

Risk Assessment Report

¹⁵ See the core documents on the V&V Agent role for additional information.

¹⁶ See the special topics on Requirements and Measures for additional information.

¹⁷ See the core document on The Accreditation Agent Role in the VV&A of Legacy Simulations for additional information.

¹⁸ See the core documents on The User Role and The Accreditation Agent Role in the VV&A of Legacy Simulations for additional information.

A [risk assessment report](#) should be prepared by whoever is responsible for conducting the risk assessment.¹⁹ Risk assessments may be conducted by the User, Accreditation Agent, M&S PM, or V&V Agent to identify different risks associated with the overall program, risks associated with using the simulation in the intended use, and even risks associated with performing or not performing specific V&V and testing activities. These risk assessments are then used during the accreditation process to determine priorities to be applied to the assessment of the simulation's fitness for the intended use.

VV&A Product Templates

The templates in this section (listed in the following table) identify the types of products produced in a VV&A effort and the types of information that should be considered for inclusion in each. Each template is organized as a main document and a series of attachments. When information to be included in a product is already included in another, that product should be referenced or included as an attachment.²⁰ These templates are intended to be comprehensive, not prescriptive. The products produced and the information included in each should be determined by the needs of the specific application.

Accreditation Templates [p. 9]
• Accreditation Plan [p. 9]
• Accreditation Assessment Report [p. 11]
• Accreditation Report [p. 13]
• Acceptability Criteria Report [p. 14]
V&V Templates [p. 15]
• V&V Plan [p. 15]
• V&V Report [p. 18]
• M&S Requirements Verification Report [p. 19]
• Simulation Conceptual Model Validation Report [p. 20]
• Design Verification Report(s) [p. 21]
• Implementation Verification Report [p. 22]
• Results Validation Report [p. 23]
• Data V&V Reports [p. 24]
Supporting Product Templates [p. 25]

¹⁹See the special topic on Risk Assessment and Its Impact on VV&A for additional information.

²⁰While it is usually desirable to have necessary information pulled together in one location, it is normally not feasible; however, care should be taken to ensure other products referenced (and not included as attachments) do exist and are current and available upon request.

• M&S Requirements Matrix [p. 25]
• Simulation Capability Report [p. 26]
• Simulation Selection Report [p. 26]
• Risk Assessment Report [p. 27]

Accreditation Templates

Accreditation Plan	
A. Information about the Intended Use	
1. General program information	
a.	Program name
b.	Program sponsor or responsible agency
c.	Intended use statement, problem objectives
2. M&S methodology (for each simulation involved) (attach or reference M&S summary information)	
a.	Selected simulation
b.	List of simulation capabilities of interest (or attach or reference Simulation Capability Report(s) [p. 26] ²¹)
c.	Intended M&S use in the program (e.g., level of importance of M&S involvement, impact on the decision process, integration with other methods being used)
3. Accreditation officials	
a.	Accreditation Authority (agency or person making the accreditation decision)
b.	Accreditation Agent and assessment participants, including credentials, experience, etc.
B. Information about the M&S Requirements	
1. Prioritized list of the M&S requirements to be addressed (or attach or reference M&S Requirements Matrix [p. 25])	
2. M&S requirements verification information (or attach or reference M&S Requirements Verification Report [p. 19])	
3. Acceptability criteria to be used in accreditation assessment (or attach or reference Acceptability Criteria Report [p. 14])	
C. Information about Risk (or attach or reference Risk Assessment Report [p. 27])	
1. List of risks identified associated with the overall intended use (application program)	
2. List of risks identified associated with using the specified simulation	
a.	Risks associated with individual M&S requirements
b.	Risks associated with specific simulation functions
D. Accreditation Information Needs	

²¹ Simulation Capability Reports are used in legacy simulation reuse only.

Accreditation Plan	
1.	List of the information to be obtained from the V&V effort and from testing
2.	List of the information about the simulation to be obtained from Developer, M&S PM, M&S Proponent, simulation owner, or V&V Agent
a.	Model development background information
	<ul style="list-style-type: none"> Initial developers and development sponsor Reason for initial development (e.g., project, study) Model development methods applied Major model modification sponsors and developers Reason for modifications (e.g., project, study) Model modification methods applied
b.	Implications of operational environment requirements
c.	Hardware configuration needed to run the simulation including implications of storage and storage devices, processor speed, telecommunications links
d.	Software environment needed including operating system, language processors, support software, display software, data base systems
e.	Information about data and data sources
f.	Description of configuration management system
g.	Personnel needed including number and types of expertise needed for M&S operation and analysis
h.	Security requirements
3.	M&S use history in similar applications ²²
a.	Program or application (repeat for each application)
	<ul style="list-style-type: none"> POC Version of M&S used Time of usage VV&A history Description of M&S usage
4.	Regulatory information
E. Information Collection Plan	
1.	Prioritized list of accreditation information needs
2.	Resources for collecting non-V&V information (including security, organizational sensitivities, information media, information storage)
3.	Schedule of collection events (including the information needs to be satisfied by each)
F. Accreditation Assessment Plan	
1.	Type of assessment (single person or team effort) with supporting rationale
2.	Nature of the assessment activities (e.g., face-to-face meetings, video teleconferences), location, length of time

²² For legacy simulations and federations only.

Accreditation Plan	
3.	Types of expertise expected in participants and anticipated sources for these people
4.	Planned methods to assist participants in preparing for the assessment (e.g., orientation steps, read-ahead materials, training)
5.	Schedule of activities and resources allocated
6.	Support personnel and equipment needed to conduct the assessment (e.g., facilitator, recorder, data collection hardware/software)
G. Programmatics	
1.	Integrated schedule including resources and schedule for all V&V and accreditation activities
2.	Participants and their responsibilities
3.	Report requirements (formats, designated authors, distribution list)
Attachments:	
1.	Program information (e.g., summary of the overall approach, schedule)
2.	M&S summary information (for each model and simulation involved)
a.	Description
	• Name
	• Version
	• Scope and overview
	• M&S sponsor or owner
	• Configuration manager
	• Proposed use (e.g., impact on decision process, integration with other methods)
	• Key representations (e.g., key objects, major functions)
	• Operating environment (intended host hardware, software)
	• Key sources of data
b.	Simulation Capabilities Report [p. 26] (for legacy simulations only)
3.	Risk Assessment Report [p. 27]
4.	M&S Requirements Matrix [p. 25]
5.	M&S Requirements Verification Report [p. 19](if available)
6.	Acceptability Criteria Report [p. 14]
7.	Pointer to referent information ²³
8.	V&V Plan [p. 15]
9.	M&S Selection Report [p. 26](if any)
10.	References
11.	Acronyms and definitions
12.	Distribution list

²³ See the special topics on Fidelity and Validation for additional information on referents.

Accreditation Assessment Report	
A. Executive Summary	
1.	Program background information
2.	Objectives of assessment
3.	Assumptions and constraints
4.	Participants
5.	Approach
6.	Results
7.	Recommendations
B. Assessment methodology	
1.	Approach for assessing simulation capabilities
2.	Approach for assessing simulation correctness
3.	Approach for assessing simulation accuracy
4.	Approach for assessing simulation usability
5.	Approach for assessing completeness of the information
6.	Approach for assessing overall fitness for purpose
C. M&S Requirements (or attach or reference M&S Requirements Matrix and Acceptability Criteria Report [pp. 25 and 14])	
1.	M&S requirements addressed (1 through i)
a.	Measures and acceptability criteria used in the assessment
b.	Method
2.	M&S requirements not addressed (1 through p)
a.	Rationale
D. Simulation	
1.	Capabilities assessed (1 through j)
2.	Assumptions assessed (1 through k)
3.	Limitations assessed (1 through l)
4.	Capabilities, assumptions, and limitations not addressed (1 through m)
E. Assessment	
1.	Comparison of M&S requirements and simulation capabilities (repeat for each simulation capability 1 through n)
a.	Model section names and descriptions involved (or attach or reference Simulation Capability Report [p. 26] if available)
b.	M&S requirements addressed
c.	V&V results of capability assessment
d.	Analysis of differences identified in terms of risk, cost, schedule
2.	Assessment of simulation correctness based on verification and testing results (attach or reference V&V Report [p. 18] and Testing reports)

Accreditation Assessment Report	
3.	Assessment of simulation accuracy based on validation and testing results (attach or reference V&V Report and Testing reports)
4.	Assessment of simulation usability
a.	Resource requirements (equipment, personnel, etc.)
b.	Adequacy and impact of configuration management controls
c.	Training needs
5.	Assessment of completeness and currency of available information
F. Results	
1.	Summary of assessment
a.	List of M&S requirements that are not adequately addressed by simulation (in priority order based on risk to the intended use)
b.	List of simulation capabilities that are not adequate to meet the needs of the intended application (in priority order based on risk to the intended use)
2.	Recommendations (repeat for each recommendation 1 through r)
a.	Rationale
b.	Risk being addressed
c.	Risk remaining
d.	Impact on cost and schedule of accepting recommendation
e.	Consequences of not accepting recommendation
G. Summary	
1.	Conclusions
2.	Recommendations
Attachments:	
1.	Accreditation Plan [p. 9]
2.	V&V Report [p. 18]
3.	Acceptability Criteria Report [p. 14]
4.	M&S Requirements Matrix [p. 25]
5.	Simulation Capability Report [p. 26] ²⁴
6.	References
7.	Acronyms and terms
8.	Distribution list

Accreditation Report	
A. Accreditation Decision (select 1 of the 5 possible accreditation decisions)	
1.	Full accreditation – the simulation produces results that are sufficiently credible to support the application

²⁴ Used in legacy simulation reuse.

2. Conditional accreditation – the simulation is limited in how it can be used to support the application:
a. List of constraints (1 through k)
b. Rationale for each constraint
3. Accreditation is deferred for modification – the simulation's capabilities are insufficient to support either full or conditional accreditation; the simulation should be modified as follows:
a. List of modifications to be made (1 through n)
b. Rationale for each modification
c. List of tests and V&V tasks to be done (1 through m)
d. Rationale for each task
4. Accreditation is deferred for information – the information provided was insufficient to support an accreditation decision; additional information is needed as follows:
a. List of information needed (1 through i)
b. Rationale for each item
c. Method for obtaining each item
d. Resources and schedule for
5. No accreditation – the results of the assessment show that the simulation is not fit to support the intended use and corrections are economically infeasible
B. Rationale for Decision
C. Accreditation Assessment Report [p. 12]
Attachments:
1. Acronyms and definitions
2. Distribution list

Acceptability Criteria Report
A. Intended Use
1. Program name 2. Problem statement 3. Program sponsor, user, or responsible agency 4. Program objectives
B. M&S Requirements, Measures and Acceptability Criteria (Requirements are grouped by area of interest and by priority)

Acceptability Criteria Report	
1. Requirement area description (repeat for each requirement area)	
2. Verified M&S requirement (repeat for each M&S requirements in the specified area of interest)	
a. Definition	
b. M&S requirement priority	
c. M&S requirement measures ²⁵	
d. Associated acceptability criteria	
3. List of objects, functions, and behaviors impacted by the requirement	
Attachments:	
1. M&S Requirements Matrix [p. 25]	
2. Documentation for problem and user domain requirements provided by User or Accreditation Agent ²⁶	
3. Documentation for simulation domain requirements provided by User, M&S PM, or M&S Proponent	
4. Pointer to referent information	
5. References	
6. Acronyms and definitions	
7. Distribution list	

V&V Templates

V&V Plan	
A. Background Information on Intended Use	
1. Program name	
2. Problem statement or synopsis	
3. Program sponsor, user, or responsible agency	
4. Major program issues and objectives	
5. M&S requirements	
6. Level of importance	
7. Major program risks	
8. Program approach and methodology summary	
a. Simulation or simulations selected	
b. Additional methods employed	
c. Simulation use in the process including relation to other methods employed	
9. Program schedule	

²⁵ See the special topic on Measures for additional information.

²⁶ See the special topic on Requirements for additional information.

V&V Plan	
B. Background Information on Simulation(s) (repeat for each simulation to be evaluated)	
1.	Simulation name
a.	Simulation version
b.	Scope of simulation capability
c.	Simulation sponsor, owner, responsible agency
d.	Simulation configuration manager
e.	List of major objects and functions represented (or attach or reference Simulation Capability Report [p. 26] ²⁷)
f.	Operating environment (intended host hardware, software)
g.	Major data sources
h.	VV&A history ²⁸
	<ul style="list-style-type: none"> Version(s) of simulation involved List of capabilities evaluated List of data sets evaluated Date(s) accomplished Summary and results Pointer to detailed reports
C. V&V Information Needs	
1.	Accreditation Information Needs to be addressed by V&V (attach or reference Accreditation Plan [p. 9])
a.	Priority of each
b.	Level of risk associated with not performing V&V on each (or attach or reference Risk Assessment Report [p. 27])
2.	Prioritized list of M&S requirements and associated measures and acceptability criteria to be used in validation (or attach or reference M&S Requirements Matrix [p. 25])
3.	Scenarios to be used
4.	Referent(s) to be used
5.	Validation data
6.	List of simulation data sets
a.	Relationship of each to simulation capabilities
b.	Level of importance of each data set based on its impact on simulation capability
c.	Level of risk associated with not performing data V&V
D. V&V Activity Plans	

²⁷ Used in legacy simulation reuse.

²⁸ For legacy simulation reuse and federations only.

V&V Plan	
<i>This section is organized around V&V activities associated with simulation development or modification artifacts and products. Other task organizations are possible, depending on the needs of the specific application.</i>	
1. M&S requirements verification activity	
a. Task 1 (repeat for tasks 1 through n)	
• Objectives	
• Areas of focus (priorities)	
• Technique to use	
• Results expected (type of result, format, metrics, etc.)	
• Resources required (data, equipment, SMEs, tools, information, etc.)	
• Timeline and coordination with other activities	
• Participants	
• Reporting requirements (formats, timelines, distribution)	
b. Identify associated data V&V tasks (described in Step 6)	
2. Simulation conceptual model validation activity (repeat Step 1 for simulation conceptual model validation tasks)	
a. Task 1 (repeat for tasks 1 through n)	
b. Identify associated data V&V tasks (described in Step 6)	
3. Design verification activity (repeat Step 1 for each design verification task for each design iteration [e.g., high level design (HLD), detailed design])	
a. Task 1 (repeat for tasks 1 through n)	
b. Identify associated data V&V tasks (described in Step 6)	
4. Implementation verification activity (repeat Step 1 for each implementation verification task)	
a. Task 1 (repeat for tasks 1 through n)	
b. Identify associated data V&V tasks (described in Step 6)	
5. Results validation activity (repeat Step 1 for results validation tasks)	
a. Task 1 (repeat for tasks 1 through n)	
b. Identify associated data V&V tasks (described in Step 6)	
6. Data V&V tasks (normally grouped by data type)	
a. Data V&V tasks associated with data type 1 (repeat for each data type)	
• Data V&V task 1 (repeat for each task associated with this data type)	
– Objectives	
– Areas of focus (priorities)	
– Data sets involved	
– Algorithms, simulation capabilities involved	
– Associated simulation V&V tasks	
– Technique to use	
– Results expected (type of result, format, metrics, etc.)	

V&V Plan	
	– Resources (data, equipment, SMEs, tools, information, etc.)
	– Timeline
	– Participants
	– Reporting requirements (format, timeline, distribution for Data V&V Reports [p. 24])
E. Summary Programmatics	
1.	List of participants
2.	List of resources required
3.	Cost estimation
4.	List of risks of not doing V&V associated with each task
5.	Reporting requirements (format of V&V report, distribution list)
6.	Composite schedule of events, activities, milestones
Attachments:	
1.	Accreditation Plan [p. 9]
2.	M&S Requirements Matrix [p. 25]
3.	Simulation Capability Report [p. 26] ²⁹ (if any)
4.	Pointer to referent(s)
5.	Description of scenarios to be used (pointers to scenarios)
6.	Integrated schedule of events
7.	References
8.	Acronyms and definitions
9.	Distribution list

V&V Report	
A. Executive Summary	
1.	Overall objectives
2.	Assumptions and Limitations
3.	Participants
4.	Approach
5.	Results
6.	Recommendations
B. Differences from V&V Plan grouped by V&V activity	
1.	Differences between requirements verification tasks executed and tasks planned and rationale
2.	Differences between simulation conceptual model validation tasks executed and tasks planned and rationale

²⁹ Used in legacy simulation reuse.

V&V Report	
3.	Differences between design verification tasks executed and tasks planned and rationale
4.	Differences between implementation verification tasks executed and tasks planned and rationale
5.	Differences between results validation tasks executed and tasks planned and rationale
6.	Differences between data V&V tasks executed and the tasks planned and rationale
C. V&V Results (grouped by V&V activity)	
1.	M&S Requirements Verification Report [p. 19]
2.	Simulation Conceptual Model Validation Report [p. 20]
3.	Design Verification Reports [p. 21]
4.	Implementation Verification Report [p. 22]
5.	Results Validation Report [p. 23]
D. Summary of V&V Analysis	
1.	Synopsis of V&V and data V&V findings
2.	Conclusions
3.	Recommendations
E. Attachments:	
1.	V&V Plan [p. 15]
2.	Accreditation Plan [p. 9]
3.	Data V&V Reports [p. 24] (by data type)
4.	Summary of resources expended
5.	Pointer to referent(s)
6.	Pointers to validation and test data, records and results
7.	Descriptions of scenarios and use cases used
8.	References
9.	Acronyms and terms
10.	Distribution list

M&S Requirements Verification Report	
A. Executive Summary	
1.	Name of program
2.	Problem statement and objectives
3.	Dates of activity
4.	Participants
5.	List of tasks performed (1 through n)
6.	Results

M&S Requirements Verification Report	
7. Recommendations	
B. Task Descriptions	
1. Task 1	
a. Approach	
	<ul style="list-style-type: none"> • Description of item under test • Techniques used • Method of measuring results
b. Information and data sources used	
c. Resources (equipment, SMEs, tools, etc.) used	
d. POC	
e. Results	
f. Recommendations	
2. Repeat B for each task performed	
C. Summary	
1. Conclusions	
2. Recommendations	
Attachments:	
1.	V&V Plan [p. 15]
2.	M&S Requirements Matrix [p. 25] (including verified requirements)
3.	Acceptability Criteria Report [p. 14]
4.	Pointer to referent
5.	References
6.	Acronyms and definitions
7.	Distribution list

Simulation Conceptual Model Validation Report	
A. Executive Summary	
1.	Name of program
2.	Problem statement and objectives
3.	Name and version of simulation involved
4.	Dates of activity
5.	Participants
6.	List of tasks performed (1 through n)
7.	Results
8.	Recommendations
B. Task Descriptions	
1.	Task 1

Simulation Conceptual Model Validation Report	
a. Approach	
• Hypothesis tested	
• Techniques used	
• Method of measuring results	
b. Information and data sources used	
c. Resources (equipment, SMEs, tools, etc.) used	
d. POC	
e. Results	
g. Recommendations	
2. Repeat 1 for each task performed	
C. Summary	
1. Conclusions	
2. Recommendations	
Attachments:	
1. V&V Plan [p. 15]	
2. M&S Requirements Verification Report [p. 19]	
3. Pointer to referent	
4. Pointer to validated simulation conceptual model	
5. M&S Requirements Matrix [p. 25]	
6. Acceptability Criteria Report [p. 14]	
7. Pointers to data sets and sources	
8. References	
9. Acronyms and definitions	
10. Distribution list	

Design Verification Reports (Repeat for each major design iteration [e.g., high level design; detailed design])	
A. Executive Summary	
1. Name of program	
2. Problem statement and objectives	
3. Name and version of simulation involved	
4. Dates of activity	
5. Participants	
6. List of tasks performed (1 through n)	
7. Results	
8. Recommendations	
B. Task Descriptions	

Design Verification Reports (Repeat for each major design iteration [e.g., high level design; detailed design])	
1.	Task 1
a.	Approach
	<ul style="list-style-type: none"> Hypothesis tested Techniques used Method of measuring results
b.	Method of measuring results
c.	Information and data sources used
d.	Resources (equipment, SMEs, tools, etc.) used
e.	POC
f.	Results
2.	Repeat 1 for each task performed
C. Summary	
1.	Conclusions
2.	Recommendations
Attachments:	
1.	V&V Plan [p. 15]
2.	M&S Requirements Matrix [p. 25]
3.	M&S Requirements Verification Report [p. 19]
4.	Acceptability Criteria Report [p. 14]
5.	Simulation Conceptual Model Validation Report [p. 20] and pointer to validated simulation conceptual model
6.	Pointer to verified design(s)
7.	Pointers to previous design verification reports
8.	Pointers to data sets and sources
9.	Acronyms and definitions
10.	Distribution list

Implementation Verification Report	
A. Executive Summary	
1.	Name of program
2.	Problem statement and objectives
3.	Name and version of simulation involved
4.	Dates of activity
5.	Participants
6.	List of tasks performed (1 through n)
7.	Results

Implementation Verification Report	
8. Recommendations	
B. Task Descriptions (repeat for each task performed)	
1. Approach	
a. Hypothesis tested	
b. Techniques used	
c. Method of measuring results	
2. Section(s) of code involved	
3. Information and data sources used	
4. Resources (equipment, SMEs, tools, etc.) used	
5. POC	
6. Results	
7. Recommendations	
C. Summary	
1. Conclusions	
2. Recommendations	
Attachments:	
1. V&V Plan [p. 15]	
2. M&S Requirements Matrix [p. 25]	
3. M&S Requirements Verification Report [p. 19]	
4. Acceptability Criteria Report [p. 14]	
5. Simulation Conceptual Model Validation Report [p. 20] and pointer to validated simulation conceptual model	
6. Design Verification Reports [p. 21] (High Level and Detailed) and pointer to verified designs	
7. Pointers to data sets	
8. References	
9. Acronyms and definitions	
10. Distribution list	

Results Validation Report	
A. Executive Summary	
1. Name of program	
2. Problem statement and objectives	
3. Name and version of simulation involved	
4. Dates of activity	
5. Participants	
6. List of requirements addressed and their associated measures and acceptability criteria used	

Results Validation Report	
7.	List of tasks performed (1 through n)
8.	Results
9.	Recommendations
B. Task Descriptions	
1.	Task 1 definition
a.	Approach
	<ul style="list-style-type: none"> Hypothesis tested (including M&S requirements addressed) Techniques used Method of measuring results (measures and acceptability criteria used)
b.	Sections of code, components involved
c.	Validation data used
d.	Resources (equipment, SMEs, tools, etc.) used
e.	POC
f.	Results
g.	Recommendations
2.	Repeat 1 for each task performed
C. Summary	
1.	Conclusions
2.	Recommendations
Attachments:	
1.	V&V Plan [p. 15]
2.	M&S Requirements Matrix [p. 25]
3.	M&S Requirements Verification Report [p. 19]
4.	Acceptability Criteria Report [p. 14]
5.	Simulation Conceptual Model Validation Report [p. 20] and pointer to validated simulation conceptual model
6.	Design Verification Reports [p. 21] (High Level and Detailed) and Pointer to verified designs
7.	Implementation Verification Report [p. 22]
8.	Pointer to referent
9.	Pointer to test documentation and data
10.	Pointer to validation data
11.	Pointer to data sets
12.	References
13.	Acronyms and definitions
14.	Distribution list

Data V&V Report (Repeat for each data set evaluated)
A. Executive Summary
1. Data description
2. Program and simulation(s) involved (name and version)
3. Data source
4. Date obtained
5. Use of data in simulation(s)
6. V&V approach
7. Results
8. Recommendations
B. Program information
1. Problem statement and objectives
2. Name and version of simulation involved
C. Data V&V Activities
1. Schedule
2. Participants
3. List of tasks performed (1 through n)
D. Task Descriptions (repeat for each task performed)
1. Approach used
2. Algorithms involved
3. Related simulation V&V tasks
4. Resources (equipment, SMEs, tools, etc.) used
5. POC
6. Results and recommendations
C. Summary
1. Conclusions
2. Recommendations
Attachments:
1. V&V Plan [p. 15]
2. Pointers to validation data
3. Pointers to algorithms
4. Pointers to tests
5. Pointers to related simulation V&V reports
6. Pointers to data sets
7. References
8. Acronyms and definitions
9. Distribution list

Supporting Product Templates

M&S Requirements Matrix									
Requirements			Requirement Tracing						
Rank / Class	Def	Measures, Criteria	Conceptual Model	HL D	Detailed Design	Code	Testing	Validation	Data
1.	xxx								
2.	xxx								
Attachments:									
1. Program background information									
2. Simulation background information									
3. References									
4. Acronyms and definitions									
5. Distribution list									

Simulation Capability Report	
A. Simulation background information	
1. Simulation name and version	
2. POC information	
3. Dates of most recent usage	
4. List of major capability areas (1 through k)	
B. Simulation capability information (repeat for each major capability area (1 through k))	
1. Description	
2. Objects represented	
3. Functions performed	
4. Behaviors represented	
Attachments:	
1. Simulation conceptual model	
2. Simulation documentation (M&S specifications, user manuals, etc.)	
3. Acronyms and definitions	
4. Distribution list	

Simulation Selection Report	
A. Program	
1. Problem statement	
2. Purpose for simulation selection	

Simulation Selection Report	
3.	List of M&S requirements to be addressed
4.	List of candidates under consideration
B. Individual candidate evaluation (for candidate 1 through n)	
1.	Identify capabilities or prepare Simulation Capability Report [p. 26]
2.	Compare candidate's capabilities to M&S requirements of intended use
3.	Additional considerations (availability, costs, resource requirements, etc.)
C. Candidate comparison	
1.	Candidate comparison
2.	Conclusions and recommendations
3.	Rationale
Attachments:	
1.	Simulation Candidate Background Information (for each candidate 1 through n)
a.	Simulation name and version
b.	POC information
c.	Dates and applications of most recent usage
d.	Resource requirements (equipment, personnel, data, costs, etc)
e.	List capabilities or Simulation Capability Reports [p. 26] (1 through n)
2.	M&S Requirement definitions and priorities
3.	Acronyms and definitions
4.	Distribution list

Risk Assessment Report ³⁰	
A. Executive Summary	
1.	Purpose of the assessment
2.	Persons and organizations participating in the assessment
3.	Approach
4.	Results (risks identified)
5.	Recommendations
B. Information needed for assessment	
1.	Information about the intended use
a.	Name
b.	Sponsor or responsible agency
c.	Problem statement
d.	Objectives

³⁰ See the special topic on Risk Assessment and Its Impact on VV&A for additional information.

Risk Assessment Report³⁰	
e.	Intended M&S use in the program (e.g., importance of M&S involvement, impact on the decision process, integration with other methods being used)
f.	Programmatics (e.g., program organization, budget, milestones, schedule, criticality, security considerations)
2.	Information on verified M&S requirements (or attach or reference M&S Requirements Verification and Acceptability Criteria Reports)
3.	Simulation capability characterization(s) (or attach or reference [validated] simulation conceptual model(s) or Simulation Capability Report (s) [p. 26]) ³¹
C. Risk assessment	
1.	Comparison of simulation capabilities and verified M&S requirements
a.	Existing simulation capabilities needed for intended use
b.	Existing simulation capabilities not needed for intended use
c.	M&S requirements not addressed by M&S capabilities
d.	Major simulation limitations for each object and function
e.	Risks associated with using the designated simulation(s)
2.	Risks associated with program features (e.g., resource requirements, scheduling, etc.)
3.	Risks associated with program objectives
D. Assessment results	
1.	List of program risks identified
2.	List of verified M&S requirements assessed
a.	Risks associated with each
b.	Priorities of each
3.	List of simulation capabilities (functions, behaviors, objects) assessed
a.	Risks associated with each
b.	Priorities of each
4.	Summary
5.	Conclusions and recommendations
Attachments:	
1.	Acceptability Criteria Report [p. 14]
2.	Simulation Capability Report(s) [p. 26] or pointer to simulation conceptual model(s)
3.	M&S Requirements Matrix [p. 25]
4.	M&S Requirements Verification Report [p. 19] (when available)
5.	Acronyms and definitions
6.	Distribution list

³¹Used in legacy simulation reuse.

References

- Joint Accreditation Support Activity (JASA), Accreditation Information Requirements Guide (AIRGuide): A Guide for Determining the Type Scope and Depth of Evidence that is Needed to Support M&S Accreditation (draft), November 2000.
- Muessig, P. R., Laack, D. R. and Wroblewski, J. J., "Optimizing the Selection of VV&A Activities A Risk/Benefit Approach." Proceedings of the 1997 Summer Computer Simulation Conference. Arlington VA. pp 855-860.
- Muessig, P.R., Laack, D.R., and Wroblewski, J.J., An Integrated Approach to Evaluating Simulation Credibility. Proceedings, Summer Computer Simulation Conference, Vancouver, BC, July 2000

RPG References in This Document

- select menu: *RPG Core Documents*, select item: "Accreditation Agent Role in the VV&A of Legacy Simulations"
- select menu: *RPG Core Documents*, select item: "Accreditation Agent Role in the VV&A of New Simulations"
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- select menu: *RPG Special Topics*, select item: "Measures"
- select menu: *RPG Special Topics*, select item: "Requirements"
- select menu: *RPG Special Topics*, select item: "Risk Assessment and Its Impact on VV&A"
- select menu: *RPG Special Topics*, select item: "Validation"

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